REMARKS

Claims 1, 4, 5 and 21-32 are all the claims pending in the application.

Review and reconsideration on the merits are respectfully requested.

Canceled Claims and New Claims

Claims 2, 6, 8-10, 12-16, and 18-20 are canceled (Claims 3, 7, 11 and 17 were previously canceled).

Claims 21-32 are added as new claims in this amendment. Support for the new claims may be found in the specification as originally filed, for example, in original Claims 9-14, 15-19 and 20 and pages 6-11. No new matter has been added. Entry of the Amendment is hereby requested.

Claim Rejections - 35 U.S.C. § 102

Claims 1, 9 and 15 have been rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Okuyama et al. ('607) for the reasons described in the Office Action.

The rejection is respectfully traversed.

Claim 1 has been amended as discussed below. Claims 9 and 15 have been canceled in light of the new Claims 27-30 and 31-32 which are based on Claims 9 and 15.

The floppy disk of Applicants' independent Claim 1 is clearly patentable over Okuyama et al. for at least the following reasons and for the reasons incorporated by reference from Applicants' Amendment under 37 C.F.R. § 1.111, filed on April 10, 2002.

For "anticipation" under 35 U.S.C. § 102, the reference must describe, either explicitly or inherently, every element/limitation of the Applicants' claims.

Applicants have amended independent Claim 1 to further define the present invention: A floppy disk comprising a base material and, sequentially formed on both surfaces of said base material, a metal seed layer, a primer layer, a magnetic layer, a protective layer, and a lubricant layer, wherein said base material comprises a nonmagnetic flexible support member with a thickness in the range of 30 - 150 μm and formed on both surfaces of said nonmagnetic flexible support member a heat-resistant macromolecular flattening layer, wherein said heat-resistant macromolecular flattening layer comprises at least one type of silicone resin, polyimide resin, polyamideimide or polyamide resin, wherein the linear expansion coefficient of the seed layer (E_{SE}) and the linear expansion coefficient of the primer layer (E_{UL}) satisfy a relation of: $|E_{SE} - E_{UL}| / E_{UL} < 0.3$, and the tensile strength of the seed layer (S_{SE}) and the tensile strength of the primer layer (S_{UL}) satisfy a relation of: $S_{SE} / S_{UL} > 1$.

Support for the amendment to Claim 1 may be found in the specification as originally filed, for example, in original Claims 1, 2, 5, 6, 7, 8 and 20 and pages 3-13. No new matter has been added. Entry of the Amendment is hereby requested.

Okuyama et al. fails to disclose, teach or suggest the heat-resistant macromolecular flattening layers sequentially formed on each other and the thickness of the flattening layers, the relation between the linear expansion coefficient of the metal seed layer and the linear expansion coefficient of the nonmagnetic primer layer, and the relation between the tensile strength of the metal seed layer and the tensile strength of the nonmagnetic primer layer.

Okuyama et al. fails to disclose, teach or suggest the magnetic layer composition of Applicants' new Claims 27-30, wherein the Cr concentration of the CoCr alloy is within the

range of 10-30 atom %, and the primer layer composition of Applicants' new Claims 31-32, wherein the nonmagnetic primer layer comprises Cr or a nonmagnetic alloy containing Cr as main component, and the Cr content of the primer layer is within the range of 77-100 atom %.

The Examiner cites to Figure 25 of Okuyama et al. which describes the dependency of the in-plane coercive force (Hc) of two Co alloy magnetic recording media different from each other in primer film upon the thickness of the Ti thin film. However, Applicants respectfully submit that Figure 25 of Okuyama et al. does not disclose the elements of new Claims 27-30 and 31-32.

For the reasons given above, Applicants request that the Examiner reconsider and withdraw the rejection of Claim 1 under 35 U.S.C. § 102(e) as being anticipated by Okuyama et al. and allow new Claims 27-30 and 31-32 which include some of the subject matter of rejected Claims 9 and 15.

Claim Rejections - 35 U.S.C. § 103

Claims 2, 4-6, 8, 10, 12-16, 18 and 19 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Okuyama et al. and further in view of Hosoi et al. ('794) for the reasons given in the Office Action.

Claim 20 has been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Okuyama et al. in view of Hosoi et al. ('794), and further in view of Okudaira et al. ('853) and Maro et al. ('801) for the reasons given in the Office Action.

Applicants respond as follows.

Applicants have canceled Claims 2, 6, 8-10, 12-16 and 18-20, but have amended Claims 1 and 4 and added new Claims 21-32. (Claims 3, 7, 11 and 17 were previously canceled). Support for the amendment to Claims 1 and 4 may be found in the specification as originally filed, for example, in original Claims 1, 2, 5, 6, 7, 8 and 20 and pages 3-11. No new matter has been added. Entry of the amendment is hereby requested.

The rejection of Claim 4 is respectfully traversed based on its dependency from Claim 1, newly amended with traversing arguments given above. The dependent Claims 21-32 are patentable for the same reasons as set forth above covering Claim 1.

As background and context information, Applicants note that the invention of the present application relates to a floppy disk, which has a support member having a thickness of 30 - 150 μm and made from at least one type of silicone resin, polyimide resin, polyamideimide or polyamide resin, which have low thermal capacity.

Applicants submit that if a metal film made of a magnetic material is formed on the surface of the base material, the support member may be thermally deformed even when radiation heat is very low. To prevent thermal deformation, tension is applied to the film, and a flattening layer with a specific thickness is provided. However, even though a flattening layer increases the heat-resistant property of the film, cracking may still occur during the formation of the metal film due to the tension applied on the film because adhesion to the base material is not sufficiently high.

Applicants state that, in this respect, the present invention claims a floppy disk which solves the above problem by setting the linear expansion coefficient of each of the primer layer and the seed layer to the claimed relation.

Also, in the floppy disk of the present invention, micro-projections consisting of a filler of inorganic oxide are provided on the flattening layer in order to maintain an interface between the magnetic head and the disk. (See claims 23-24).

The floppy disk of the present invention comprises a base material and a flattening layer made of organic substances (at least one type of silicone resin, polyimide resin, polyamideimide or polyamide resin), a filler (for example, particles of inorganic oxide), a seed layer and a primer layer, and it is a multi-layer structure having different thermal characteristics and different dynamic characteristics. Therefore, cracking in floppy disks known from the prior art is likely to occur between a flattening layer and a metal layer even when slight heat is applied on it.

For example, as shown by the results of the new Comparative Experiments 12 and 13 (shown below), many cracks occur when the thickness of the flexible support member is varied outside of Applicants' claimed range of thickness of 30-150 μm for the flexible support member.

Comparative Example 12: A floppy disk was prepared by the same procedure as in Example 1 except that a flexible support member made of polyimide of 25 μm in thickness was used, and the number of cracks occurred in the floppy disk was determined by the same procedure as in Example 1. The number of cracks was 30.

Comparative Example 13: A floppy disk was prepared by the same procedure as in Example 1 except that a flexible support member made of polyimide of 160 μm in thickness was

used, and the number of cracks occurred in the floppy disk was determined by the same procedure as in Example 1. The number of cracks was 28.

In comparison, in Applicants' Examples 1-12, when the thickness of a polyimide flexible support member was 75 μm, unexpectedly either no cracking was found on the surface of the specimen or cracks were found at only 2 points or less. More than two cracks were not found in Applicants' Examples 1-12, indicating very good or good results (See Table 1 at pages 17-18).

Furthermore, the present invention provides a floppy disk which uses a macromolecular flattening layer within the range of 0.1 - 0.5μm as the support member which solves the problems caused by thermal influence.

In contrast, Applicants state that in Okuyama et al. and Maro et al., the use of a plastic substrate is described, but each of these references relates to a large base material with a higher thickness used in a manner similar to a hard disk. Accordingly, the specific problem of thermal deformation of the material as in the case where a thin film is used as the base material does not occur.

Further, Hosoi et al. relates to a polyester film for a magnetic tape, in which a filler layer and a magnetic layer are formed on a base film, and thickness of the support member is reduced in order to maintain volume recording density.

In the arrangement of Hosoi et al., the influence from the tension applied during the manufacture of the magnetic recording medium or the influence of thermal deformation is high. As a result, the magnetic layer made of metal thin film is often damaged. When a magnetic recording medium of magnetic disk type using a flexible support member is used as in the

present invention, and if the thickness of the support member is reduced, the posture during rotation of the disk is turned to unstable. At that point, it is not possible to stably keep a distance between the disk and the head, and trouble may occur in recording and reproduction of the signal onto the magnetic recording medium.

However, as described above, according to the present invention, a flexible support member of 30 - 150 μm in thickness is used. As a result, it is possible to provide a magnetic recording medium, which exhibits stable performance and in which no trouble occurs in recording and reproduction of the signal.

The Examiner recognizes that neither Okuyama et al. nor Hosoi et al. disclose the linear expansion coefficient of the seed layer and the linear expansion coefficient of the primer layer as satisfying the claimed relationship set forth in Claim 20. But the Examiner asserts that given the teachings of Maro et al., the Examiner deems that the disclosed Ti seed layer would meet Applicants' claimed limitation and furthermore, one of ordinary skill in the art would have assertedly been motivated to optimize the linear expansion coefficients of the two layers such that they would be as close as possible to avoid the formation of cracks in the recording medium, as allegedly taught by Maro et al. (See col. 2, lines 9-13).

This rejection is respectfully traversed.

Although Maro et al. describes a large difference in the coefficient of thermal expansion between the resin and Cr or Co alloy constituting the recording film, Maro et al. states in the next paragraph proposals to solve this problem by specific processes, none of which include optimizing the linear expansion coefficients of the two layers such that they would be as close as

possible to avoid the formation of cracks in the recording medium. (See Maro et al., col. 2, lines 9-31). Furthermore, in the first embodiment of the invention of Maro et al., at least one of an Si layer, an SiNCO layer and an AlNCO layer is formed between a resin substrate and an underlayer, thereby preventing crazings caused by the underlayer. (See Maro et al., col. 4, lines 10-14). In the second embodiment, a layer composed of at least one material selected from the group consisting of Ti, Ta, Mo, V, Zr, Nb and their alloys is formed between a resin substrate and an underlayer as a lowest layer, thereby preventing crazings caused by the underlayer. (See Maro et al., col. 4, lines 38-43).

Applicants respectfully submit that the embodiments in Maro et al. do not disclose, teach, or motivate one to optimize the relationship between the linear expansion coefficient of the seed layer and the linear expansion coefficient of the primer layer.

Applicants respectfully submit that the newly amended independent Claim 1, which incorporates many of the elements of canceled Claim 20, is patentable over the primary reference, Okuyama et al., and Applicants respectfully submit that none of the secondary references teach or suggest the claimed features or are combinable with Okuyama et al. in a manner which allegedly suggests the present invitation of Claim 1.

Moreover, Applicants respectfully submit that Okuyama et al. fails to disclose or suggest a seed layer as recited in Applicants' newly amended Claim 1, much less the more particular characteristics of the seed layer as recited in the pending claims.

Therefore, for all of the reasons given above, Applicants request that the Examiner reconsider and withdraw the rejection of Claim 4 under 35 U.S.C. § 103(a) as being unpatentable

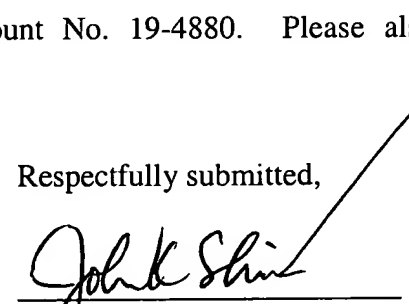
over Okuyama et al. and further in view of Hosoi et al., and Applicants respectfully submit that the pending claims are patentable over the disclosure of Okuyama et al. in view of Hosoi et al. ('794), and further in view of Okudaira et al. ('853) and Maro et al. ('801).

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 2, 6, 8-10, 12-16, 18-20 are canceled without prejudice or disclaimer.

The claims are amended as follows:

1 (Amended). A floppy disk[,] comprising a base material and, sequentially formed on both surfaces of said base material, a metal seed layer, a primer layer, a magnetic layer, a protective layer, and a lubricant [lubricating] layer,

wherein said base material comprises a nonmagnetic flexible support member with a thickness in the range of 30 - 150 μm and formed on both surfaces of said nonmagnetic flexible support member a heat-resistant macromolecular flattening layer, wherein said heat-resistant macromolecular flattening layer comprises at least one type of silicone resin, polyimide resin, polyamideimide resin or polyamide resin,

wherein the linear expansion coefficient of the seed layer (E_{SE}) and the linear expansion coefficient of the primer layer (E_{UL}) satisfy a relation of: $|E_{SE} - E_{UL}| / E_{UL} < 0.3$, and the tensile strength of the seed layer (S_{SE}) and the tensile strength of the primer layer (S_{UL}) satisfy a relation of: $S_{SE} / S_{UL} > 1$ [coated on at least one of the surfaces of a flexible nonmagnetic support member, whereby a seed layer is provided between the flexible support member and the primer layer].

4 (Twice Amended). A floppy disk according to claim 1 [2], wherein the thickness of the flattening layer is within the range of 0.1 - 5.0 μm.

Claims 21-32 are added as new claims.